Oscilloscope and Function Generator User Manual

BLESA 2024 Final Project

October 1, 2024

1 Introduction

This device serves two primary functions: as an oscilloscope and a function generator. It can be controlled through physical buttons or a touchscreen interface. LED indicators provide device status feedback. The device also features Wi-Fi connectivity.

2 LED Indicators

- **Green LED (turned on)**: Device is on
- **Green LED (fast blink)**: Function generator active
- **Green LED (slow blink)**: Oscilloscope active
- **Blue LED (slow blink)**: Connected to Wi-Fi
- **Both LEDs on**: Error state

3 Controls

Buttons:

- **BTN1(up button)** and **BTN3 (down button)**: Navigate through the screen
- **BTN2(right button)**: Select the focused button (similar to the Enter key)

The touchscreen can also be used for control, providing an intuitive interface for parameter adjustments.

4 Function Generator

The function generator can produce four types of signals:

- Sine wave
- Square wave (with adjustable duty cycle from 0% to 100%)

- Sawtooth wave
- Triangle wave

Key Features:

- Frequency range: 1 kHz to 10 kHz
- Amplitude range: 100 mV to 3.3 V
- Visual feedback of the generated signal on the display with labeled X and Y axes
- Duty cycle range: 0% to 100 % (1% resolution is available only in range 1000 Hz - 1250 Hz)
- Save and load up to 4 signal presets
- Easily pause and resume the signal generation

5 Oscilloscope

The oscilloscope supports two channels, with independent X-axis adjustment for each. It measures voltage from 0 V to 3.3 V and displays the signal's peak-to-peak voltage in real-time.

Key Features:

- Voltage range: 0V to 3.3V
- Refresh rate: 1 Hz
- ms/div range: 5 ms/div to 1000 ms/div
- Dynamic peak-to-peak voltage measurement (displayed in millivolts)
- Screenshot functionality for later inspection

6 Additional Features

- The device monitors temperature and humidity, updating every 5 seconds.
- If the temperature exceeds 30°C, the device automatically stops and requests restart.
- Stores and displays the last 5 minutes of humidity and temperature data.
- Wi-Fi connectivity.

7 Specifications

- **Function Generator:**
  - Frequency: 1kHz to 10kHz
  - Amplitude: 100mV to 3.3V
  - Duty cycle: 0% to 100% (square wave)
- **Oscilloscope:**
  - Voltage range: 0V to 3.3V
  - Refresh rate: 1 Hz
  - Dynamic measurements: Peak-to-peak voltage

8 Getting Started

To begin using the device:

- Power on the device.
- Use the buttons or touchscreen to navigate and select functionalities.
- Monitor the LED signals for device status.
- Wi-Fi will connect automaticall with hardcoded provisioning.

9 Safety and Maintenance

Ensure the device operates below 30°C to avoid automatic shutdown. Keep the device in a cool, dry environment to prevent overheating.